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GB 0924401 A US 4165688 A

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(54) Printing apparatus

(57) A divider seal 10 for a split-fountain chambered doctor blade for a printing press, comprising a seal contoured to sealingly engage a circumferential surface of a rotating cylinder, a seal retainer for retaining the seal in sealing engagement with the rotating cylinder, and pneumatic biasing structure, such as a pneumatic bladder, acting on the seal retainer for resiliently biasing the seal into sealing engagement with the rotating cylinder. The seal is located axially between the ends of the ink fountain 12 to allow different coloured inks to be used. A recess 38 is fed with water via channels 40, 42. Components of the seal may be of high molecular weight foam material aluminium or moulded plastics.

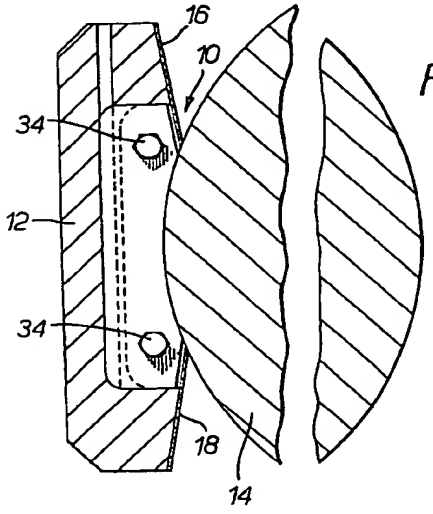

Fig. 1.

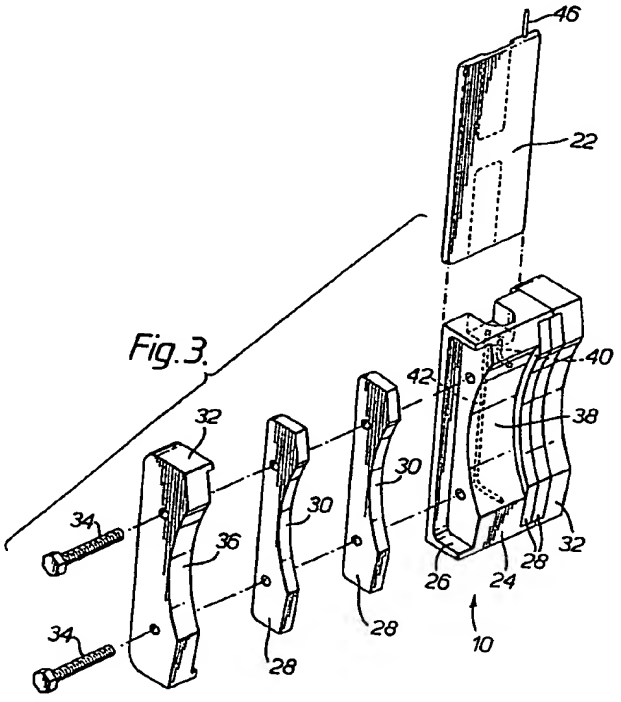

Fig. 3.

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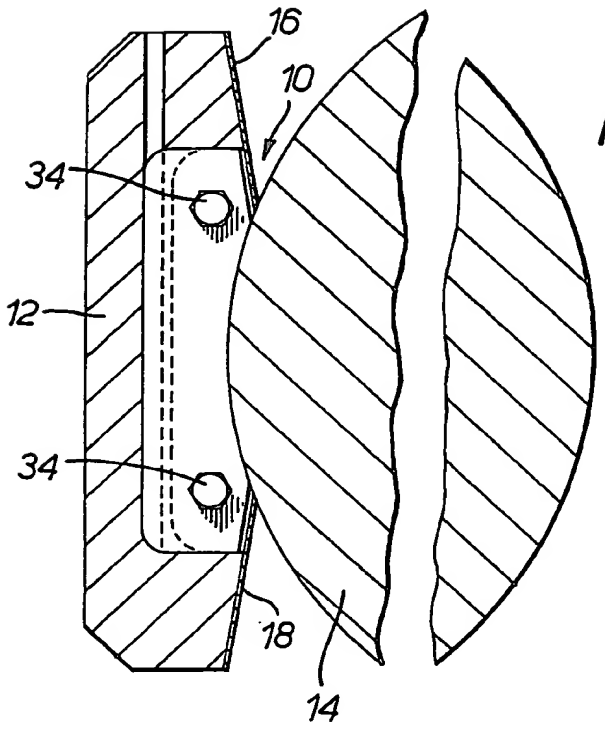

Fig. 1.

Fig. 2.

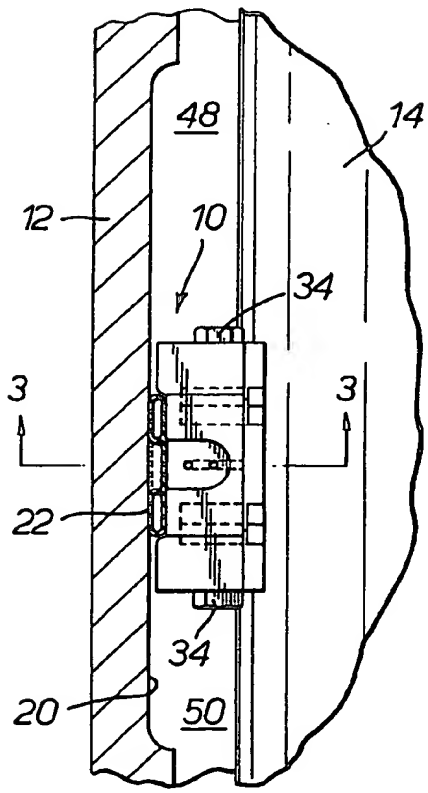

Fig.4.

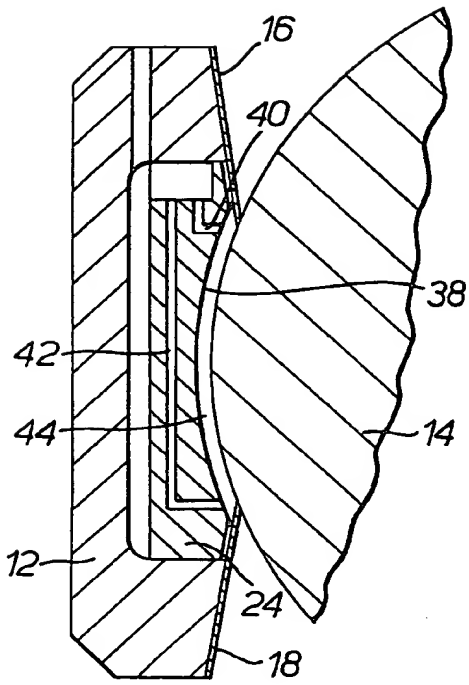
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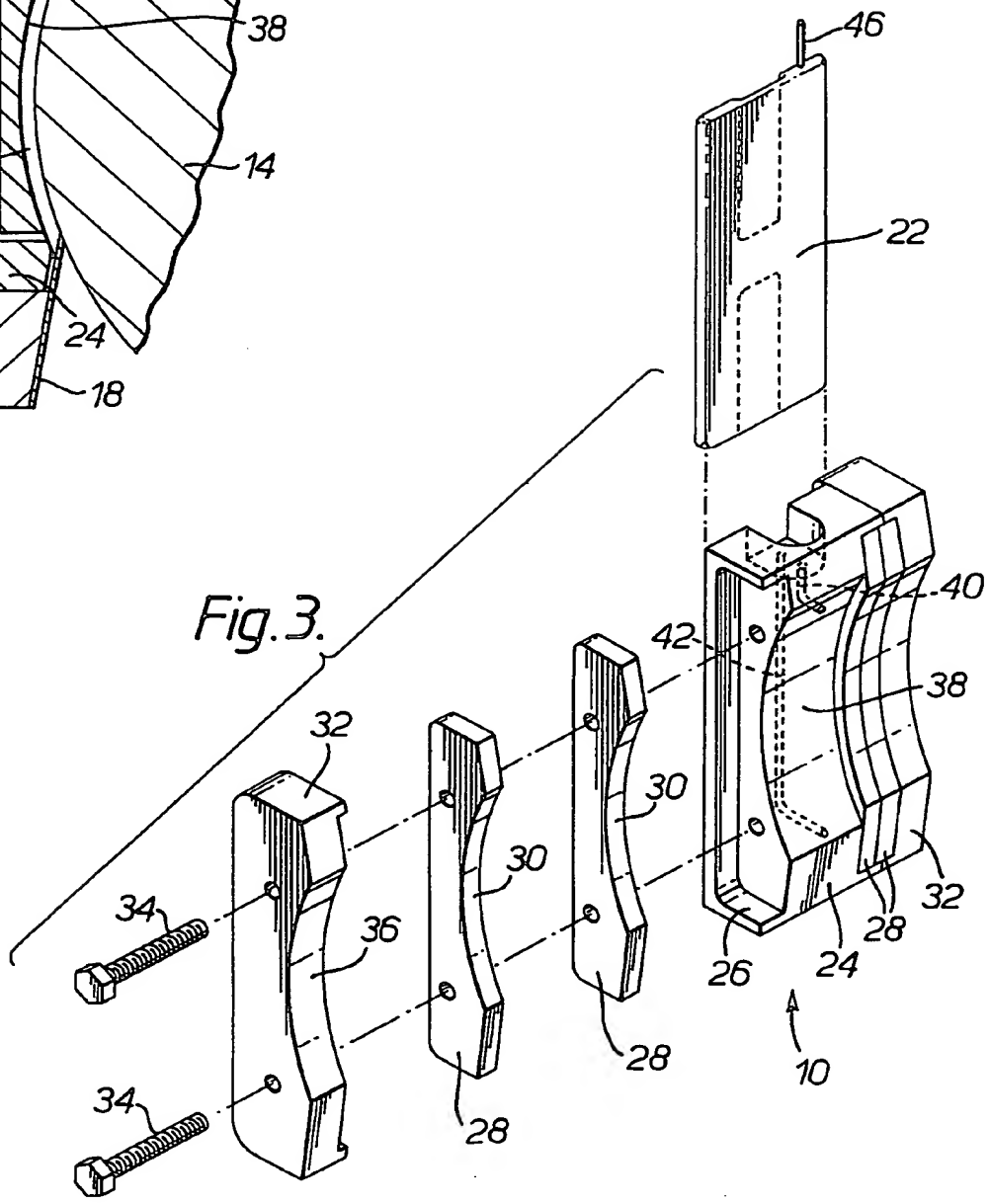
Fig.3.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Printing Apparatus

The present invention relates particularly to flexographic printing presses which utilise a chambered doctor blade ink fountain, and is more particularly concerned with split-fountain chambered doctor blades which permit simultaneous printing with two or more different colour inks, where the seal of the present invention may be used to divide the chambered doctor blade into two or more chambers.

Flexographic printing is a rotary letter press printing process which traditionally uses flexible rubber, or other elastomer, printing plates and liquid, fast drying ink. An advantage of flexographic printing is its simple ink distribution system.

In flexographic printing, a web to be imprinted is passed between an impression cylinder and a plate cylinder, from which the ink is transferred to the web. Ink is applied to the plate cylinder in precisely-controlled quantities by an anilox (R.T.M.) metering roll. The circumferential surface of the anilox roll is divided into a very large number of small cells (typically, 15,000 cell per square centimetre). The surface of the anilox roll is flooded with ink, thus filling the cells on the roll's surface. Ink is fed to the anilox roll by an ink fountain. A commonly-used ink fountain comprises an ink reservoir and a pair of doctor blades which contact the anilox roll above and below the reservoir. The surface of the anilox roll, the doctor blades and the reservoir define a closed chamber for containing the ink. As the anilox roll rotates, the doctor blades shave the surplus ink from the surface of the anilox roll so that ink is carried only in the interior of the cells on the roll's surface and not on the lands between cells. This results in a uniformly metered film of ink being applied to the surface of the plate cylinder.

Typically, the ink fountain extends the entire length of the anilox roll and plate cylinder. In cases where it is desired to print more than one colour on a web, which requires more than one colour of ink, the chamber containing the ink in the ink fountain is divided into two or more subchambers or compartments by ink dams or dividers. These dividers are designed to maintain a fluid-tight seal between compartments in the ink fountain and to maintain a seal against the anilox roll.

Ink fountain dividers per se are known in the art, and are illustrated in, for example, U.S. patents 3,381,517, 4,559,871, 4,667,595,

and 4,796,528.

These prior arrangements are mechanically very complex. They are thus expensive to fabricate, require careful and precise alignment, and are susceptible to misalignment in use. There is therefore a need for a simple, inexpensive divider seal which is easy to fabricate and install, requires no time-consuming alignment, can compensate for wear and misalignment, and still provides an effective divider seal. The present invention fulfils that need.

The present invention is a divider seal for a split-fountain chambered doctor blade for a printing press, comprising seal means contoured to sealingly engage a circumferential surface of a rotating cylinder, retaining means for retaining the seal means in sealing engagement with the rotating cylinder, and pneumatic biasing means acting on the retaining means for resiliently biasing the seal means into sealing engagement with the rotating cylinder.

The pneumatic biasing means offers a high degree of compliance and allows for variations in wear and alignment in use.

An example of apparatus according to this invention is shown in the accompanying drawings in which:

Figure 1 is a side elevational view, partially in section, of an ink fountain and an anilox roll, of which the ink fountain is equipped with the divider seal according to the present invention.

Figure 2 is a top plan view, partially broken away, of the divider seal and anilox roll shown in Figure 1.

Figure 3 is an exploded view of the divider seal according to the present invention.

Figure 4 is a sectional view, partially broken away, taken along the lines 3-3 of Figure 2.

Referring now to the drawings, wherein like numerals indicate like elements, there is shown in Figure 1 a divider seal 10 according to the present invention mounted in a chambered doctor blade ink fountain 12, in sealing engagement with an anilox roll 14. Anilox roll 14 has already been described and is known in the art, and need not be described in further detail, except to note that, as previously described, anilox roll 14 rotates on its axis relative to ink fountain 12. Also, ink fountain 12 has already been described and is known in the art, and will be described only with the degree of detail necessary to understand the present invention. In that regard, ink fountain 12 comprises upper and lower

doctor blades 16 and 18 which contact the surface of the anilox roll and meter the amount of ink supplied to the anilox roll by ink fountain 12. Doctor blades 16 and 18 are conventional and known in the art.

As seen in Figure 1, divider seal 10 has a sealing surface which is contoured to and contacts the surface of anilox roll 14 which extends into ink fountain 12 between doctor blades 16 and 18. Divider seal 10 is otherwise dimensioned to fit within the chamber of chambered doctor blade ink fountain 12, which is of uniform cross-section.

Figure 2 illustrates the divider seal 10 as seen from above, with ink fountain 12 partially in section to permit divider seal 10 to be clearly seen. As best seen in Figure 2, divider seal 10 is spaced a short distance from the rear wall 20 of ink fountain 12. Between the rear wall of ink fountain 12 and divider seal 10 is a biasing means in the form of a pneumatic bladder 22. Pneumatic bladder 22 may be pressurised and depressurised to apply more or less biasing force to divider seal 10, thereby controlling the loading force of divider seal 10 against anilox roll 14.

Referring now to Figure 3, the various parts of divider seal 10 are shown in an exploded view. Divider seal 10 comprises a manifold 24, which includes lateral recesses on either side. Recess 26 is visible in Figure 3. Recess 26 receives at least one, and preferably two, seal members 28. Seal members 28 are preferably made of an ultrahigh molecular weight closed foam material, and each seal means has a contoured surface 30 contoured to the curvature of anilox roll 14 so as to intimately engage the surface of anilox roll 14 when the seal means 28 are brought into contact with the surface of anilox roll 14. Seal means 28 and end cap 32 may be retained on manifold 24 by any suitable means, such as threaded fasteners 34. End cap seal 32 also has a contoured surface 36, which has substantially the same contour as contoured surface 30 of seal means 28.

Manifold 24 is substantially symmetrical along its longitudinal axis, and therefore receives a pair of seal means 28 and an end cap seal 32 on both sides.

Manifold 24 may be made of any suitable material. For example, manifold 24 may, for example, be machined from aluminium, or moulded in plastic. A preferred material for manifold 24 is aluminium with a Teflon (Registered Trade Mark) coating. End cap seals 32 are preferably moulded from an ultrahigh molecular weight plastic.

It will be seen in Figure 3 that, as with seal means 28 and end cap seals 32, manifold 24 has a contoured surface 38. However, contoured surface 28 is contoured to a curvature having a radius slightly greater than the curvature of contoured surfaces 30 and 36 of seal means 28 and end cap seals 32. This provides a small gap between anilox roll 14 and contoured surface 38, as best seen in Figure 3.

Referring now to Figure 4, manifold 24 is shown in section. Manifold 24 includes a pair of liquid flow channels 40 and 42. (Channels 40 and 42 are shown in phantom in figure 3.) These channels serve to supply and drain water to the gap 44 between contoured surface 38 and anilox roll 14. Gap 44 forms a water reservoir defined by contoured surface 38, anilox roll 14 and top and bottom doctor blades 16 and 18. Water is preferably supplied to reservoir 44 through flow channel 40 and drained, preferably by vacuum, through channel 42. The water in reservoir 44 fills the interstices in seal means 28, so that there is a film of water between seal means 29 and the surface of anilox roll 14. The film of water serves as both a low-friction bearing and a fluid seal.

Seal means 28 are biased into sealing engagement with anilox roll 14 by the pneumatic bladder 22. Bladder 22 is positioned between manifold 24 and the rear wall 20 of ink fountain 12, as previously described. Air is supplied to and exhausted from bladder 22 through an air supply conduit 46. By pressurising bladder 22, seal means 28 are biased into sealing engagement with the surface of anilox roll 14. The biasing force can be controlled by controlling the internal pressure of bladder 22. Since bladder 22 is pneumatically pressurised, bladder 22 is resilient. That is, bladder 22 permits divider seal 10 to move toward and away from rear wall 20 as anilox roll 14 rotates, to compensate for variations in the surface of anilox roll 14, such as a slightly out-of-round condition or slight misadjustment, for example where the ink fountain 12 is not exactly parallel to the axis of anilox roll 14. In addition, bladder 22 enables divider seal 10 to move toward anilox roll 14 to compensate for wear of both the surface of anilox roll 14 and the contoured surfaces 30 of the seal members 28, as a result of normal use. Since air is a compressible fluid, bladder 2 can be pressurised to a degree that will enable divider seal 10 to move toward and away from rear wall 20 of ink fountain 12, as may be required by out-of-round conditions in anilox roll 14, misalignments, and wear.

It will be appreciated that ink fountain 12 can be divided into two

or more compartments (see Figure 2) by using one or more divider seals 10. Thus, ink fountain 12 may be divided into two compartments 48 and 50 by using a single divider seal 10. If two divider seals are used, ink fountain 12 can be divided into three compartments, and so on, so that any number of compartments as desired may be provided.

It will also be noted that neither bladder 22 nor divider seal 10 are fixedly attached to rear wall 20 of ink fountain 12. Thus, divider seal 10 can be placed at any desired location along anilox roll 14, so that the lateral extent of the compartments 48 and 50 can be infinitely variable. Thus, the invention permits not only any desired number of compartments to be formed in ink fountain 12, but enables the lateral extent of the compartments so formed to be infinitely varied as desired. Hence, the present invention makes it very simple to reconfigure ink fountain 12 for different colours and dimensions. This reduces set-up time between printing runs, thereby reducing press down time and increasing equipment utilisation and throughput.

Claims

1. A divider seal for a split-fountain chambered doctor blade for a printing apparatus, comprising

a. seal means contoured to sealingly engage a circumferential surface of a rotating cylinder,

b. movable retaining means for retaining the seal means in sealing engagement with the rotating cylinder,

c. pneumatic biasing means movable with the retaining means and acting on the retaining means for resiliently biasing the seal means into sealing engagement with the rotating cylinder.

2. A divider seal according to claim 1, wherein the pneumatic biasing means comprises a pneumatic bladder.

3. A divider seal according to claim 2, further comprising means for selectably increasing and decreasing the pneumatic pressure in the bladder.

4. A divider seal according to claim 2, wherein the seal means comprises an ultra-high molecular weight closed foam.

5. A divider seal according to claim 1, further comprising a gap between the retaining means and the circumferential surface of the rotating cylinder, and means for supplying a liquid to said gap to form a liquid interface between said retaining means and circumferential surface.

6. A flexographic printing apparatus having an anilox roll and a chambered doctor blade ink fountain adjacent the anilox roller for applying printing ink thereto, a movable divider seal for dividing the doctor blade chamber into at least two compartments, the compartments containing different colour inks therein, said divider seal comprising a seal member contoured to and in sealing engagement with the outer circumferential surface of the anilox roller, a seal retainer for retaining the seal member in engagement with the circumferential surface of the anilox roller, and an inflatable and deflatable pneumatic bladder mounted between the back surface of the seal retainer and an

opposed wall of the doctor blade assembly for applying a biasing force to the seal retainer and the seal member for resiliently biasing the seal member into engagement with the circumferential surface of the anilox roller.

7. A divider seal according to claim 6, wherein said pneumatic bladder is positioned between the seal retainer and a rear wall of the ink fountain.

8. A divider seal according to claim 7, wherein the divider seal is infinitely positionable along the length of the anilox roll between the anilox roll and said rear wall of the ink fountain.

9. Printing apparatus comprising an ink fountain mounted adjacent to a roll adapted to receive a film of ink from the fountain, the fountain comprising means defining an ink chamber extending parallel to the axis of the roll, at least a portion of the chamber being of uniform cross-section and containing chamber divider which is selectively positionable at various positions in the uniformly sectioned part of the chamber and includes at least one sealing portion having a concave surface adjacent to and conforming with the surface of the roll, and including a bladder positioned between a back surface of the divider and an opposed wall of the chamber and adapted to seal the gap between the said back surface and the chamber wall and, when pressurised, to bias the concave seal surface of the divider resiliently into sealing engagement with the roll.

10. Printing apparatus according to claim 9, in which the said back surface of the divider and the said opposed chamber wall are both substantially flat and are both substantially parallel to a tangent to the roll at approximately a mid-point along the said concave surface of the sealing portion, whereby expansion of the bladder produces a series of biasing forces on the divider which are substantially parallel to a radius of the roll at the said mid-point.

11. Printing apparatus according to claim 9 or claim 10, in which the chamber divider includes a second sealing portion spaced from and similar to the first-mentioned sealing portion, the surface of the

divider between the sealing portions being recessed to define a semi-annular chamber adjacent to the roll, and including means for delivering liquid into the semi-annular chamber to form an additional barrier, supplementing the sealing effects of the seal portions, between inks contained during use in the portions of the ink chamber on opposite sides of the divider.

12. Apparatus according to any one of claims 1 to 11 and substantially as described with reference to the accompanying drawings.

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Patents Act 1977 **Examiner's report to the Comptroller under Section 17 (The Search Report)**	Application number GB 9301101.3
Relevant Technical fields (i) UK Cl (Edition L) B6C CEBB, CEBE, CEBX (ii) Int Cl (Edition 5) B41F	Search Examiner A DARCY
Databases (see over) (i) UK Patent Office (ii) ONLINE DATABASE: WPI	Date of Search 26 MARCH 1993

Documents considered relevant following a search in respect of claims 1-12

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 0924401 A - (TIMSON) see element 5, figure 2	1-3,6,9
X	US 4165688 A - (MAGNA-GRAPHICS) see example figure 2	1-3,6,9